

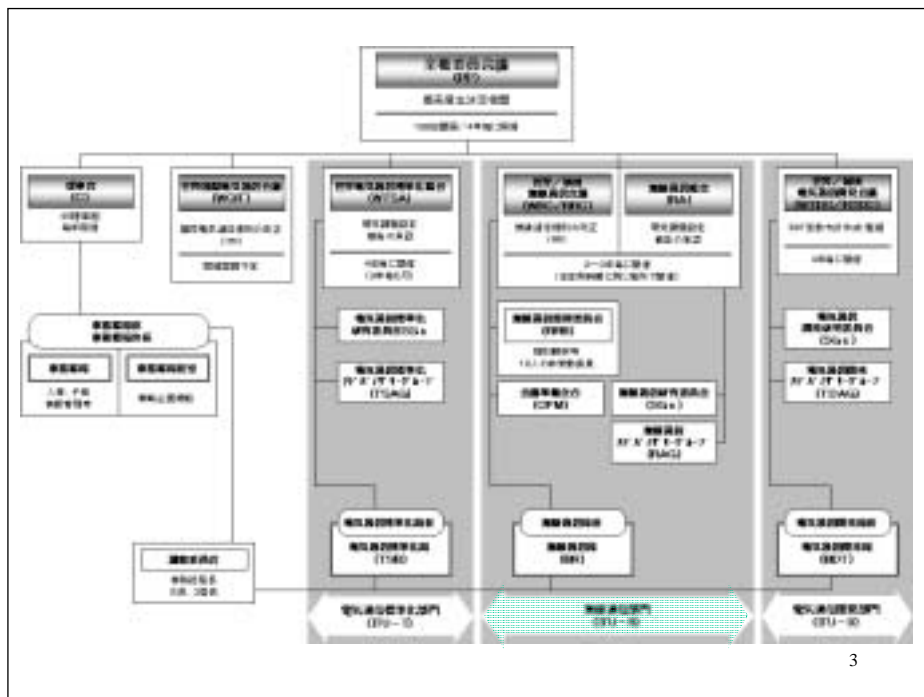
2006.11.17
 第509回URSI-F資料
 於: 東京工科大学

ITU - R SG3における伝搬技術の標準化動向

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内容

1. ITU-R SG3関連WP会合の概要
 ・2006年9月～10月にかけて開催
2. 各WPの状況
 ・WP3J, K, Mにおける勧告修正、勧告作成への
 取組み例
 ・日本提案の審議結果
3. 今後の取組みについて
 ・動向と次回会合へ向けた対処について



会議の概要

期間: 2006年9月28日～10月10日
 WP3J: 9月28日～10月6日
 WP3K: 9月29日～10月6日
 WP3L: 10月3日～10月6日
 WP3M: 9月28日～10月6日
 SG3: 10月9日～10月10日
 場所: ITU本部(ジュネーブ)
 参加者数: 約75名(24ヶ国14機関、日本からは8名)
 寄与文書数: 4つのWP会合とSG会合を合わせて191件(日本からは15件/そのうちの2件はWP3JとWP3Mの両方に入力したため、延べ件数では17件)
 出力文書数: 92件(WP合計で)

参加登録者数(人)					寄与文書数(件)				
WP3J	3K	3L	3M	SG3	3J	3K	3L	3M	SG3
73	71	44	72	52	44	41	18	49	39
7	7	4	6	6	7	7	1	2	0

← 日本

日本寄書リスト

No.	Doc.	Title	
1	3M/144	Information related to Recommendation ITU-R P.530-11 - Characteristics of millimetre wave rain fade duration	(3/131)
2	3M/145	Contribution to ITU-R data banks - Statistics of rain attenuation and rain fade event duration	(3/132)
3	3L/76 Rev1	Revision to Recommendation ITU-R P.1147-3 - Prediction of sky-wave field strength at frequencies between about 150 and 1 700 kHz - Numerical method for predicting monthly median field strengths including daytime values at frequencies between about 150 and 1 700 kHz	
4	3K/114	Proposed revision to Recommendation ITU-R P.1410 - Experimental results on in-band amplitude dispersion of broadband spectrum under shadowing conditions caused by obstacles around a terminal antenna	
5	3K/115	Proposed revision to the working document towards a revision of Recommendation ITU-R P.1411-3 - Path loss prediction model for over-rooftop propagation environments	
6	3K/116	Proposed revision to Recommendation ITU-R P.1411 - SHF propagation within street canyons	
7	3K/117	Proposed revision to Recommendation ITU-R P.1238 - Angular spread model for indoor propagation	
8	3K/118	Proposed revision to Recommendation ITU-R P.1238-4 - Representation of parameters for modeled path loss function	
9	3K/119	Support document for a new method of predicting the delay profile for broadband land mobile services using UHF and SHF bands	
10	3K/120	Information document - The prediction of power arrival angular profile for land mobile services using the SHF bands	
11	3J/126	Additional information for the working document towards a draft for a new Recommendation on rain dynamics - Parameters related to number of rain events and duration	
12	3J/127	Proposed revision to working document towards a PDNR on effects of building materials and structures on radiowave propagation above about 100 MHz - Uniform geometrical theory of diffraction (UTD) for a wedge obstacle	
13	3J/128	Measurement of vegetation attenuation in 26 GHz band	
14	3J/129	Proposed revision to Recommendation ITU-R P. 1407-2 - Multipath propagation and parameterization of its characteristics	
15	3J/130	Contribution to ITU-R DATA BANKS - Long-term Ka/Ku-band slant path rain attenuation and rain rate statistics	
16	3J/131	Information related to Recommendation ITU-R P.530-11 - Characteristics of millimetre wave rain fade duration	(3M/144)
17	3J/132	Contribution to ITU-R data banks - Statistics of rain attenuation and rain fade event duration	(3M/145)

日本からの寄与状況

最近の会合における寄与文書数と出席者数の推移 *1 SG会合は除く

年	WP/SG	寄与文書数*1		出席者数		開催地
		日本	全体	日本	全体	
1999	J,K,L,M/SG	4	72	3	67	Geneva
2000	K	5	17	2	30	Munich
	J,K,L,M/SG	8	136	4	56	Geneva
	TG3/2	1	10	1	24	Geneva
2001	J,M	1	66	2	62	Budapest
	K	7	32	1	30	York
2002	J,K,L,M/SG	12	118	2	64	Geneva
2003	J,K,L,M	10	153	4	58	Fortaleza
2004	J,K,L,M/SG	13	147	7	70	Geneva
2005	J,K,L,M	11	108	9	65	Cleveland
2006	J,K,L,M/SG	15	152	8	75	Geneva

SG3 の構成

SG - 3 : 電波伝搬			
議長: D. G. Cole (豪) 副議長: D. V. Rogers (カナダ), B. Arbesser-Rastburg (ESA), J. Wang (米国)			
WP	Sub - WG	審議項目	議長
3J: 基本伝搬 M. Pontes (ブラジル)			
	3J - 1	晴天時大気の影響	L. Castanet (仏国)
	3J - 2	雲及び降水の影響	M. Pontes (ブラジル)
	3J - 3	雑音と地表波伝搬	L. Barclay (英国)
	3J - 4	マッピングと統計的側面	L. Castanet (仏国)
	3J - 5	植生と障害物の回折	A. Nyuli (ハンガリー)
3K: ポイント・エリア伝搬 R. Grosskopf (ドイツ)			
	3K1	サイトスペシフィックな推定法	A. Paul (米国)
	3K2	ポイント・エリア伝搬	P. McKenna (米国)
	3K3	屋内屋外短距離伝搬	A. Sato (日本)
	3K4	ミリ波アクセスシステム伝搬	T. Tjelta (Telenor)
	3K5	UWB	A. Kholod (スイス)
3L: 電離圏伝搬 J. Wang (米国)			
	3L-1	電離圏および HF 伝搬	L. Barclay (英国)
	3L-2	PLT および 2MHz 以下の伝搬	A. Paul (米国)
	3L-3	電離圏外伝搬	B. Arbesser-Rastburg (ESA)
3M: ポイント・ポイント伝搬 C. Wilson (オーストラリア)			
	3M1	地上伝搬	T. Tjelta (Telenor)
	3M2	衛星伝搬	F. Haidara (米国)
	3M3	干渉伝搬	G. Feldhake (米国)
	3M4	データバンク	B. Arbesser-Rastburg (ESA)

WP3Jにおける主な審議結果

7件の勧告案を作成し、SG3会合で承認。

	Doc.	タイトル	
1	3/48	Draft revision to Recommendation ITU-R P.834-5 - Effects of tropospheric refraction on radiowave	承認
2	3/62	Draft revision of Recommendation ITU-R P.526-9 - Propagation by diffraction	承認
3	3/63	Draft revision of Recommendation ITU-R P.1321-1 - Propagation factors affecting systems using digital modulation techniques at LF and MF	承認
4	3/64	Draft revision of Recommendation ITU-R P.368-8 - Ground-wave propagation curves for frequencies between 10 kHz and 30 MHz	承認
5	3/65	Draft revision to Recommendation ITU-R P.833-5 - Attenuation in vegetation	承認
6	3/83	Draft revision of Recommendation ITU-R P.1407-2 - Multipath propagation and parameterization of its characteristics	承認
7	3/84	Draft revision of Recommendation ITU-R P.676-6 - Attenuation by atmospheric gases	承認

P.1407改訂には今回会合へ入力した日本寄与が反映されている。

Working Parties 3J and 3K
DRAFT REVISION OF RECOMMENDATION ITU-R P.1407-2
Multipath propagation and parameterization of its characteristics

Summary

This revision to Recommendation ITU-R P.1407-2 includes additional information on multi-path propagation characteristics and expands the section on the parameters of direction of arrival of multi-path component.

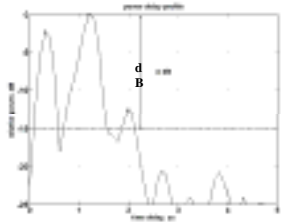


FIGURE 3
Power delay profile indicating multipath components above threshold level

Add the following sentence to the end of § 2.1 Definitions.

“The number of multipath or signal components is the number of peaks in a power delay profile whose amplitude are within A dB of the highest peak and above the noise floor.”

3 Parameters of direction of arrival

3.1 Definitions

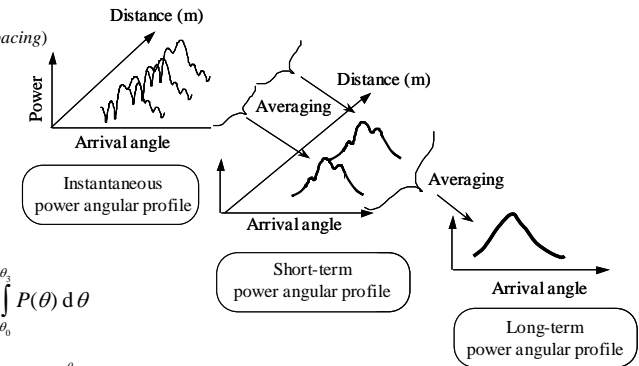
average arrival angle

r.m.s. angular spread

angular window

angle interval (or angular spacing)

FIGURE 4



•(a) Total energy
$$P_0 = \int_{\theta_0}^{\theta_2} P(\theta) d\theta$$

•(b) Average arrival angle
$$T_A = \frac{1}{P_0} \int_{\theta_0}^{\theta_2} \theta P(\theta) d\theta$$

•(c) R.m.s. angular spread
$$S_A = \sqrt{\frac{1}{P_0} \int_{\theta_0}^{\theta_2} (\theta - T_A)^2 P(\theta) d\theta}$$

到来角度特性評価法に関する用語, 定義, 導出式の明確化

新レポート案の作成

1. The analysis of radio noise data.
2. Measuring the input parameters for the radiative energy transfer model of vegetation attenuation

新勧告案の作成

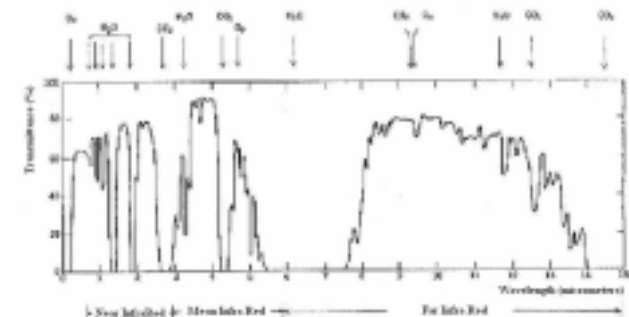
1. Propagation required for the design of Free Space Optical links
2. Prediction methods required for the design of Free Space Optical links
3. Models for conversion to 1-minute rain rate statistics from various integration time data

新勧告に向けた検討

1. Investigations on vegetation loss and comparisons with measurements to further extend the applicability of models
2. Testing of methods for synthesis of time series of rain attenuation in slant paths and terrestrial links
3. It is expected that the results of studies currently in progress on radio noise will become available in time for the next meeting

WORKING DOCUMENT TOWARDS A PRELIMINARY DRAFT NEW RECOMMENDATION
Propagation data required for the design of free space optical links

FIGURE 1
Transmittance of the atmosphere due to molecular absorption



- 3 Molecular scattering
- 4 Aerosol absorption
- 5 Aerosol scattering
- 6 Scintillation
- 7 Rain attenuation
- 8 Snow attenuation
- 9 Ambient light attenuation
- 10 Cumulative distribution of attenuation
- 11 Hybrid/FSO systems
- 12 Visibility measurement

FIGURE 10
Different attenuations exceeded for different percentages of time

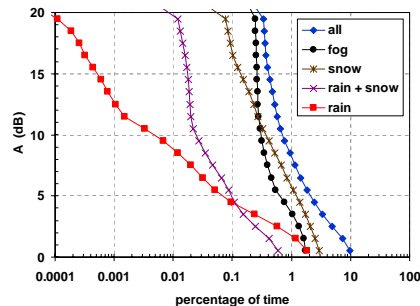


FIGURE 11
Different RF and FSO attenuations exceeded for different percentages of time

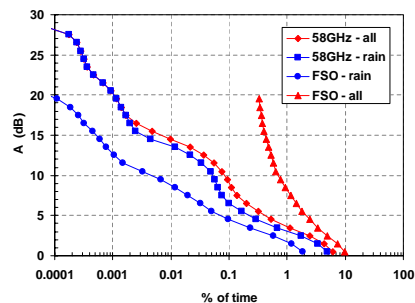


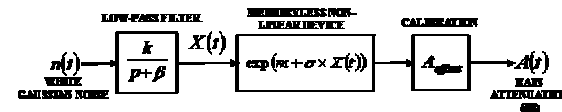
TABLE 4
Availability ratio comparison of RF, FSO and hypothetical RF/FSO hybrid systems

System	AR (%)
FSO part (850 nm)	99.7
RF part (58 GHz)	99.999
hybrid RF/FSO	99.9999

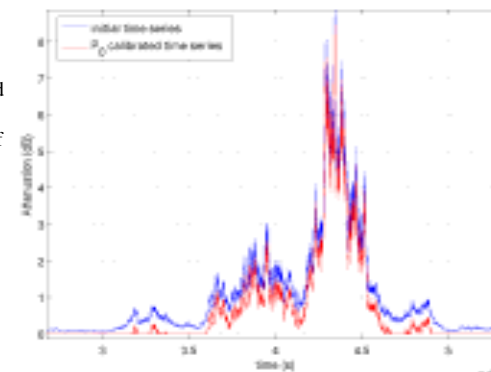
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WORKING DOCUMENT TOWARDS A PRELIMINARY DRAFT NEW RECOMMENDATION FOR TROPOSPHERIC ATTENUATION TIME SERIES SYNTHESIS

FIGURE 1
Principle of the time series synthesizer



- The long-term distribution of rain attenuation is log-normal, characterized by two parameters: respectively the mean m and the standard deviation σ of its napierian logarithm.
- Rain attenuation can be transformed into a first order stationary Gauss-Markov process using the non-linear transformation: $x = \frac{\ln A_{rain} - m}{\sigma}$



Calibration of synthetic time series with the assessed offset

WP3Kにおける主な審議結果

3件の勧告案を作成し、2件をSG3会合で承認。

Doc.	タイトル	
1	3/67 Draft revision of Recommendation ITU-R P.1238-4 - Propagation data and prediction methods for the planning of indoor radiocommunication systems and radio local area networks in the frequency range 900 MHz to 100 GHz	承認
2	3/73 Draft revision of Recommendation ITU-R P.1411-3 - Propagation data and prediction methods for the planning of short-range outdoor radiocommunication systems and radio local area networks in the frequency range 300 MHz to 100 GHz	保留
3	3/77 Draft revision of Recommendation ITU-R P.1410-3 - Propagation data and prediction methods required for the design of terrestrial broadband radio access systems operating in a frequency range of about 3-60 GHz	承認

いずれの勧告案にも日本からの提案が多数盛り込まれている。
P.1238についてはMIMO対応のための到来角度特性に関する内容を追加。
P.1410についてはマイクロ波帯FWA伝搬特性に関する記述を追加。
P.1411についてはSHF帯ストリートキャニオン伝搬損失推定法と屋根越え伝搬特性推定法の適用領域拡張を目指したが、SG会合で更なる改善要望が出て今回は議長報告止まりとなった。

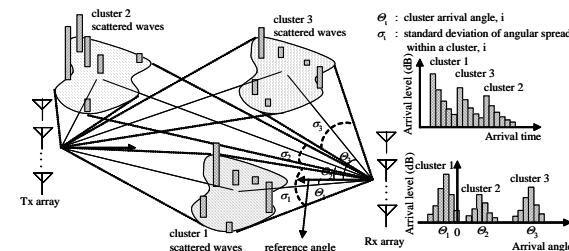


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DRAFT REVISION OF RECOMMENDATION ITU-R P.1238-4
Propagation data and prediction methods for the planning of indoor radiocommunication systems and radio local area networks in the frequency range 900 MHz to 100 GHz

9 Angular spread models
9.1 Cluster model

FIGURE 2
Image of cluster model



9.2 Angular distribution of arrival waves from within i -th cluster

The probability density function of the angular distribution of arrival waves within a cluster is expressed by:

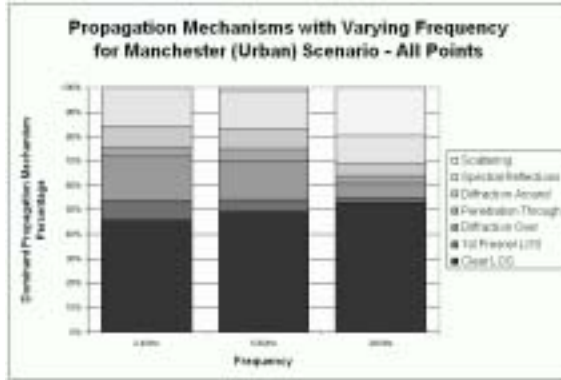
$$P_i(\phi - \theta_i) = \frac{1}{\sqrt{2}\sigma_i} \exp\left(-\sqrt{2}\left|\frac{\phi - \theta_i}{\sigma_i}\right|\right)$$

	•LOS		•NLOS	
	•Mean [deg.]	•Range [deg.]	•Mean [deg.]	•Range [deg.]
•Hall	•23.7	•21.8-25.6	•-	•-
•Office	•14.8	•3.93-28.8	•54.0	•54
•Home	•21.4	•6.89-36	•25.5	•4.27-46.8
•Corridor	•5	•5	•14.76	•2-37

DRAFT REVISION OF RECOMMENDATION ITU-R P.1410-3
 Propagation data and prediction methods required for the design of terrestrial broadband millimetric radio access systems operating in a frequency range of about 203-560 GHz

1 Introduction

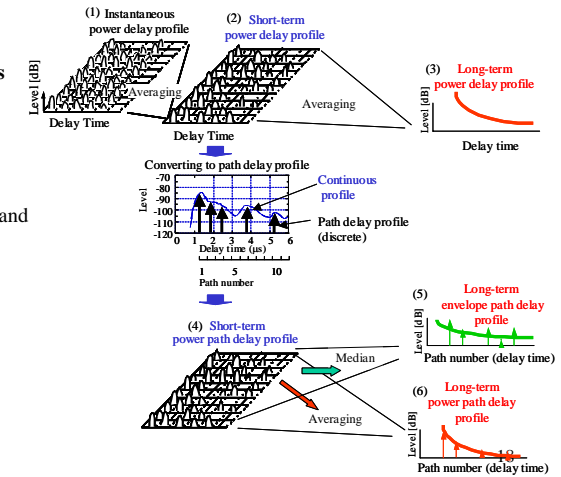
There is a growing interest in delivery of broadband services through local access networks to individual households as well as small business enterprises. Millimetricwave radio solutions are being increasingly considered as delivery systems, and these are now available on a testing market. Several systems are being considered and introduced, such as local multipoint distribution system (LMDS), local multipoint communications system (LMCS), and point-to-multipoint (P-MP) system. Collectively, these systems may be termed broadband wireless access (BWA). International standards are being developed, for example WiMAX based on IEEE802.16 and HiperMAN.



A PRELIMINARY DRAFT NEW RECOMMENDATION ON
 THE PREDICTION OF THE DELAY PROFILE FOR BROADBAND
 LAND MOBILE SERVICES USING UHF AND SHF BANDS

The prediction of the delay profile for broadband land mobile services using UHF and SHF bands

FIGURE 1
 Definition of various delay profiles



- 2 Definition of delay profiles and parameters
- 3 Envelop path delay profile
- 4 Power path delay profile
- 5 Path delay profile for loss representation in urban and suburban areas
- 6 Examples

新勧告案

1. Path specific prediction method

The structure of a path specific prediction method for terrestrial services has been drafted as well as a detailed work programme and a testing procedure. For the next WP 3K meeting the 3 remaining candidates for such a method will be investigated and tested. Based on these results a DNR on a path specific prediction method will be drafted at the next meeting of WP 3K.

2. UWB devices

Continue work on the further development of the DNR on propagation models for ultra-wideband devices.

新勧告へ向けた動き

1. Delay profiles

The draft new Recommendation on the prediction of the delay profile for broadband land mobile services using UHF and SFH bands will be further developed. The applicability of the model to other services such as fixed wireless access should be verified. (日本提案)

勧告改訂の継続

1. Path general prediction method

There is still an urgent need to test the predictions of Recommendation ITU-R P.1546 against measurements from regions prone to ducting and super-refractivity and to further develop the Recommendation to cover predictions for these areas.

2. Short path prediction methods

The models for short path indoor and outdoor propagation will be further developed. They cover an extremely wide frequency range and types of environment, so more measurements and modelling work are needed to provide additional guidance.

FRAMEWORK FOR THE DEVELOPMENT OF A PDNR ON A PATH SPECIFIC PROPAGATION PREDICTION METHOD

The new model should meet the following specifications:

- %-time: 1-50%
 - Frequency range: 80 – 3000 MHz
 - Range: 1 – 1000 km
 - Will predict field strength at the top of clutter
- The input parameters will include the following:
- Latitude and longitude of terminals
 - Path profile (terrain only)
 - Terminal heights
 - Antenna gains
 - %-time
 - Frequency

A possible breakdown of model elements might be:

- Diffraction
- Lower-troposphere variability (e.g. ducting)
- Troposcatter
- Combination process

In the initial version of the model, it is not intended to model clutter or building penetration.

TABLE 1
Summary of available measurement data

Data set	Sub set	No of measurements	Frequency range	Location	Path Length	Tx heights	Rx heights	Rx antenna	Measurement types	Single measurement or % Time
Sandell		25,000		UK					Fixed	1 - 50%
COS T210										.001 - 50%
ITS	Phase 1 VHF		20 - 100 MHz	Colorado Mountains USA			1 - 10 m		Fixed	Single
	Phase 2 UHF		230 - 10000 MHz	Various USA		1 - 24			Mobile	Single
	Low antenna		230 - 416 MHz	Various USA	2 - 45 km	0.75 - 3 m	0.75 - 3		Fixed	Single
	Ft. Huachuca		60 MHz	Ft. Huachuca, USA	12 - 16.5 km	10	2		Mobile	Single
	Taso		55 - 800 MHz	Various USA	1.7 - 193 km	High broadcast	9		Shunt	Single
Aegis			230 MHz, 1.5 GHz	UK (London, South coast)	1-20	High, med	1.5m	Omni	Mobile	single
			2.4 GHz, 3.4 GHz	UK (various)	1-40		5-25m	1-15m	Omni & dir	Fixed, mobile

EBU	BBC			Various UK						Single
	BBC L-Band			Reigate UK						Single
	BBC New			Various UK						Single
	ERT			Various Greece						Single
	Hol			Various Netherlands						Single
	IRT			Various Germany						Single
	IRT L-Band			Various Germany						Single
	IRT Stationary			Various Germany						Single
	ORF			Various Austria						Single
	RAI			Various Italy						Single
	S			Various Sweden						Single
	S New			Various Sweden						Single
	Sui			Various Switzerland						Single
	TDF			Various France						Single
	YLE			Various Finland						Single
	YLE Stationary			Various Finland						Single
	BBC logging			Various NW Europe						1 - 50%
YLE logging			Various N Europe						1 - 50%	

WP3Mにおける主な審議結果

3件の勧告案を作成しSG3会合で承認。

	Doc.	タイトル	
1	3/60	Draft revision of Recommendation ITU-R P.530-11 - Propagation data and prediction methods required for the design of terrestrial line-of-sight systems	承認
2	3/61	Draft revision of Recommendation ITU-R P.682-1 - Propagation data required for the design of Earth-space aeronautical mobile telecommunication systems	承認
3	3/75	Draft revision of Recommendation ITU-R P.1144-3 - Guide to the application of the propagation methods of Radiocommunication Study Group 3	承認

- ・日本からの寄与については今回の勧告改訂には直接リンクしていない。
- ・P.530改訂では過去の日本寄与を進展させる形で改訂された部分もある。

・フェードダイナミクスについては2003年の日本寄与から検討が本格化しつつある。今後も関連するデータバンク入力とともに継続的な貢献が重要。
 ・データバンクについてはフェードダイナミクス、衛星伝搬長期測定結果等の有効な入力ができ、各国からの期待感が高まっている。前者については他国からの入力の呼び水になっていることもあって単なる一国の寄与に止まらない展開を見せている。
 ・3Kや3Jでの表立った寄与と異なり、近い将来に役立つ寄与を行っている状況。

SG3の研究課題

No	Q.	タイトル	WP
1	201	地上及び衛星通信システム並びに宇宙研究応用の計画に必要な電波気象データ	J
2	202	地表における伝搬の推定法	J
3	203	30MHz以上の周波数における地上放送、広帯域固定アクセス及び移動業務のための伝搬データと推定法	K
4	204	地上見通し回線のための伝搬データと推定法	M
5	205	見通し外回線のための伝搬データと推定法	M
6	206	固定衛星業務と衛星放送業務のための伝搬データと推定法	M
7	207	約0.1GHz以上における衛星移動及び無線標準業務のための伝搬データと推定法	M
8	208	固定衛星業務と地上業務に影響する周波数共用上の伝搬因子	M
9	209	システム性能解析における変動率と危険率パラメータ	J
10	211	300MHzから100GHzの周波数範囲における近距離パーソナル無線通信、アクセスシステム及び無線LAN(WLAN)のための伝搬データと伝搬モデル	K
11	212	電離圏の特性	L
12	213	電離圏及び電離圏貫通無線通信の運用パラメータの短期予報	L
13	214	電波雑音	J
14	218	宇宙通信システムに及ぼす電離圏の影響	L
15	221	スプラディックE層及び他の電離によるVHF及びUHFの伝搬	L
16	222	測定とデータバンク	L
17	225	LF及びMF帯におけるデジタル変調技術を含めたシステムに影響を及ぼす伝搬因子の予測	L
18	226	衛星伝搬路の電離圏・対流圏特性	L/M
19	227	HF帯のチャネルシミュレーション	L
20	228	275GHz以上の周波数を使う宇宙通信及び宇宙科学業務のための伝搬データ	M
21	229	1.6-30MHzでデジタル変調を用いる場合の空間波、信号強度、伝送品質および信頼性の推定	L